

CLAIMS

1. A dimming system in a projection display, the dimming system comprising:
 - a first non-absorbing polarizer, the first non-absorbing polarizer receiving light from a light source and passing at least a portion of the light having a first selected polarization;
 - a variable polarization rotator, the variable polarization rotator receiving the light having the first selected polarization from the first non-absorbing polarizer and selectively rotating the polarization of the received light;
 - a first heat absorber; and
 - a second non-absorbing polarizer, the second non-absorbing polarizer receiving the selectively rotated light from the variable polarization rotator and passing a first portion of the light having a second selected polarization to display optics in the projection display and passing a second portion of the light to the first heat absorber.
2. The dimming device of claim 1 wherein the first non-absorbing polarizer comprises a reflective polarizer.
3. The dimming device of claim 1 wherein the second non-absorbing polarizer comprises a reflective polarizer.
4. The dimming device of claim 3 wherein the reflective polarizer comprises a polarizing beam splitter.

5. The dimming device of claim 1 wherein at least one of the first non-absorbing polarizer and second non-absorbing polarizer comprises a scattering polarizer.
6. The dimming device of claim 1 wherein the first non-absorbing polarizer comprises a polarization converter.
7. The dimming device of claim 1 wherein the first non-absorbing polarizer comprises a reflective polarizer, and wherein the first non-absorbing polarizer reflects a portion of the light not passed in a direction away from the variable polarization rotator.
8. The dimming device of claim 1 wherein the first non-absorbing polarizer reflects a portion of the light not passed in a direction toward a second heat absorber.
9. The dimming device of claim 1 wherein the variable polarization rotator comprises a liquid crystal cell.
10. The dimming device of claim 1 wherein the variable polarization rotator comprises a pair of variable polarization rotators selected to have substantially opposite angular variation.
11. The dimming device of claim 1 wherein the variable polarization rotator is configured such that different spatial portions of the rotator can selectively rotate the polarization of the received light in different amounts.

12. The dimming device of claim 1 further comprising a third non-absorbing polarizer, the third non-absorbing polarizer receiving the light of the second selected polarization from the second non-absorbing polarizer and passing a portion of the light to the display optics.
13. The dimming device of claim 12 further comprising a clean up polarizer between the third non-absorbing polarizer and the display optics.
14. The dimming device of claim 1 further comprising a clean up polarizer between the first non-absorbing polarizer and variable polarization rotator.
15. The dimming device of claim 1 wherein the display optics in the projection display includes an image modulator to create an image on the projection display.

16. A dimming system for a projection display, the dimming device comprising:

a first heat absorber;

a first polarizing beam splitter, the first polarizing beam splitter receiving light from a light source and passing a first portion of the received light having a first selected polarization to a first clean up polarizer, the first polarizing beam splitter passing a second portion of the received light having a second selected polarization to the first heat absorber;

a variable polarization rotator proximate the first clean up polarizer, the variable polarization rotator receiving the first portion of light having the first selected polarization from the first clean up polarizer and selectively rotating the polarization of the received first portion of light; and

a second heat absorber;

a second polarizing beam splitter, the second polarizing beam splitter receiving the selectively rotated light from the variable polarization rotator and passing a first portion of the selectively rotated light having a first selected polarization to display optics in the projection display, the second polarizing beam splitter passing a second portion of the selectively rotated light to the second heat absorber.

17. The dimming device of claim 16 wherein the variable polarization rotator comprises a liquid crystal cell.

18. The dimming device of claim 16 wherein the variable polarization rotator comprises a pair of variable polarization rotators selected to have substantially opposite angular variation.

19. The dimming device of claim 16 wherein the variable polarization rotator is configured such that different spatial portions of the rotator can selectively rotate the polarization of the received light in different amounts.
20. The dimming device of claim 16 further comprising a third polarizing beam splitter, the third polarizing beam splitter receiving the light of the second selected polarization from the second polarizing beam splitter and passing a portion of the light to the display optics.
21. The dimming device of claim 20 further comprising a second clean up polarizer between the third polarizing beam splitter and the display optics.

22. A dimming system in a projection display, the dimming system comprising:
 - a first polarizer, the first polarizer receiving light from a light source and passing at least a portion of the light having a first selected polarization;
 - a pair of variable polarization rotators, the pair of variable polarization rotators receiving the light having the first selected polarization from the first polarizer and selectively rotating the received light, the pair of variable polarization rotators selected to have substantially opposite angular variation;
 - a second polarizer, the second polarizer receiving the selectively rotated light from the variable polarization rotator and passing a first portion of the light having a second selected polarization to display optics in the projection display.
23. The dimming device of claim 22 wherein the first polarizer comprises an absorbing polarizer.
24. The dimming device of claim 22 wherein the first polarizer comprises a non-absorbing polarizer.
25. The dimming device of claim 22 wherein the second polarizer comprises a non-absorbing polarizer.
26. The dimming device of claim 22 wherein the first polarizer comprises a polarization converter.

27. The dimming device of claim 22 wherein the first and second polarizers comprise polarizing beam splitters.
28. The dimming device of claim 22 wherein the first polarizer comprises a reflective polarizer, and wherein the reflective polarizer reflects a portion of the light not passed in a direction away from the variable polarization rotator.
29. The dimming device of claim 28 wherein the reflective polarizer reflects the portion of the light not passed toward a heat absorber.
30. The dimming device of claim 22 wherein the pair of variable polarization rotators comprises a liquid crystal cells having similar angular characteristics but rotated substantially 180 degrees with respect to each other.
31. The dimming device of claim 22 further comprising a third polarizer, the third polarizer receiving the light of the second selected polarization from the second polarizer and passing a portion of the light to the projection display.
32. The dimming device of claim 22 further comprising a third polarizer, the third polarizer between the pair of polarization rotators.

33. A dimming system in a projection display, the dimming system comprising:
 - a first non-absorbing polarizer, the first non-absorbing polarizer receiving light from a light source and passing at least a portion of the light having a first selected polarization;
 - a variable polarization rotator, the variable polarization rotator receiving the light having the first selected polarization from the first non-absorbing polarizer and selectively rotating the received light, wherein the variable polarization rotator is configured such that different spatial portions of the rotator can selectively rotate the polarization of the received light in different amounts;
 - a second non-absorbing polarizer, the second non-absorbing polarizer receiving the selectively rotated light from the variable polarization rotator and passing a first portion of the light having a second selected polarization display optics in the projection display.
34. The dimming device of claim 33 wherein the first non-absorbing polarizer comprises a reflective polarizer.
35. The dimming device of claim 33 wherein the second non-absorbing polarizer comprises a reflective polarizer.
36. The dimming device of claim 33 wherein the first non-absorbing polarizer comprises a polarization converter.
37. The dimming device of claim 33 wherein the first and second non-absorbing polarizers comprise polarizing beam splitters.

38. The dimming device of claim 33 wherein the first non-absorbing polarizer comprises a reflective polarizer, and wherein the reflective polarizer reflects a portion of the light not passed in a direction away from the variable polarization rotator.
39. The dimming device of claim 38 wherein the reflective polarizer reflects the portion of the light not passed toward a heat absorber.
40. The dimming device of claim 33 wherein variable polarization rotator comprises a pair of variable polarization rotators configured to have substantially opposite angular variation.
41. The dimming device of claim 33 further comprising a third non-absorbing polarizer, the third non-absorbing polarizer receiving the light of the second selected polarization from the second non-absorbing polarizer and passing a portion of the light to the display optics.
42. The dimming device of claim 33 wherein the variable polarization converter is configured such that different spatial portions of the rotator can selectively rotate the polarization of the received light in different amounts by selectively rotating different annular areas in different amounts.

43. The dimming device of claim 33 wherein the variable polarization converter is configured such that different spatial portions of the rotator can selectively rotate the polarization of the received light in different amounts by selectively rotating in a checkerboard pattern.

44. The dimming device of claim 33 wherein the variable polarization rotator is imaged to an aperture stop.